

# U.S. PATENT APPLICATION

FOR

5 HYGIENIC TREATMENTS OF BODY STRUCTURES

BY

MICHAEL BLACK

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## FIELD OF THE INVENTION

This invention relates generally to hygienic devices, methods and systems. More particularly, the present invention relates to the application of hygienic effects at body structures.

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## BACKGROUND

Hygiene relates to the principles of cleanliness, promotion and preservation of health or the freeing from disease-causing microorganisms. Hygienic effects can be established in different ways of which one is through the effect of light on biological structures. For  
20 instance, the hygienic effect of visible, near ultraviolet and infrared light on biological

structures is well known and has been described to provide anti-inflammatory effects, preventative effects, anti-bacterial effects, sterilizing effects, cleaning effects, cosmetic effects, therapeutic effects, healing effects (bio-stimulative effects), bio-altering effects, pain-releaving effects, agent-penetrating effects, photo-rejuvenating effects and photo-dynamic treatment effects (See for instance a book by *Goldman* (1981) entitled "*The biomedical laser: technology and clinical applications*" and published by Springer-Verlag, New York; a book by *Katzir* (1993) entitled "*Lasers and optical fibers in medicine*" and published by Academic Press, New York; a book by *Hajder et al.* (1994) entitled "*Acupuncture and lasers*" and published by Ming, Belgrade; a book by *Tuner et al.* (1996) entitled "*Laser therapy in dentistry and medicine*" and published by Prisma Books, Grangesberg, Sweden; a book by *Alster et al.* (1996) entitled "*Cosmetic laser surgery*" and published by Wiley & Sons, New York; or a book by *Fitzpatrick et al.* (2000) entitled "*Cosmetic Laser Surgery*" and published by Mosby, St. Louis). The effects of a laser on biological structures is dependent on the laser properties (active matter, beam wavelength, continuous or impulse mode of operation), characteristics of the structures, water content, pigmentation degree, vascularization, vitality, heterogeneity, specific heat conductivity or time exposure. The photo-effect of a laser can be applied to superficial structures and subcutaneous structures. As far as the mechanisms of laser radiation effects are concerned, they may be thermal, mechanical or chemical.

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When it comes to hygiene of the body, the art teaches a wide variety of toothbrushes that include a light source aimed at providing a hygienic effect to the oral cavity, e.g. gums and teeth. However, there is a need for devices typically used for the skin, hair or nails (e.g.

brushes or combs) that include a light source aimed at providing a hygienic effect to the skin, hair or nails. The toothbrushes typically include a brush head and a light source. The light source illuminates through the bristles utilizing a certain transparency of the bristles or adjacent to the bristles. Even though these toothbrushes have the best of intentions by adding a hygienic effect to the daily exercise of tooth brushing, they cannot guarantee that the hygienic effect is actually applied to the gums or teeth. For instance, the use of toothpaste would partially or sometimes completely obstruct the penetration of the light beam, which would make the actual application of the light beam to the gums or teeth unknown and unreliable. If one assumes that the hygienic effect could in fact be reliably applied, then the current toothbrushes are still restricted to one single hygienic effect by selecting one light source that delivers radiation at one wavelength for each toothbrush. Unfortunately, the use of a single toothbrush that provides a single hygienic effect would not satisfy a much more inclusive hygienic maintenance of an oral cavity in which multiple hygienic effects would be desired. Accordingly, there is a need to provide new hygienic devices and methods that would satisfy a much more inclusive application of multiple hygienic effects for body structures such as skin, hair and nails, and their underlying structures.

## SUMMARY OF THE INVENTION

The present invention overcomes the shortcomings in the prior art by providing a device and method capable of applying hygienic effects to body structures. In one aspect, this is established by a light source capable of delivering a light beam to body structures whereby

the light beam provides a unique hygienic effect to the body structures. In another aspect, this is established by two or more light sources each capable of delivering a light beam to body structures whereby each light beam provides a unique hygienic effect to the body structures. The preferred light source is a low power light source, including light emitting diodes or semiconductor lasers, capable of delivering light from the ultraviolet, visible or infrared spectrum. An optical path is used for each light beam to apply the light beam to the body structures. The optical path could include one or more optical components such as optical fibers, lenses, spectral filters, mirrors, transparent materials, semi-transparent materials, prisms, reflective coatings, reflecting grooves, beam splitters, collimators, light channels or gratings.

Dependent on the type of body structure various kinds of hygienic effects can be selected such as, but not limited to, an anti-inflammatory effect, a preventative effect (e.g. disease, irritation or the like), an anti-bacterial effect, a sterilizing effect, a cleaning effect, a cosmetic effect, a therapeutic effect, a healing effect, a bio-stimulative effect, a bio-altering effect, a pain-releaving effect, an agent penetrating effect, a photo-rejuvenating effect, a photo-dynamic treatment effect, a skin stimulating effect, a hair growth stimulating effect or a nail treatment effect. In general, for the case of two more light sources, at least two of the same light sources could be used each delivering a unique hygienic effect or at least two different light sources could be used each delivering a unique hygienic effect. The desired hygienic effects that one would like to obtain guides the choice of light sources and its parameters. By varying parameters such as e.g. fluence, spot size, mode such as continuous

or pulsed, repetition rate, pulse duration different hygienic effects could be established.

The device could be used in a quasi-stationary manner or in a dynamic manner. In one aspect, the application of light beams at different locations to the body structures is established through movement of the device. Blending of different unique hygienic effects

5 could be achieved at different locations of the body structure. Examples of body structures include skin, hair and/or nails. Body structures could include any type of microorganism (including disease-causing microorganisms), cell layers, tissues, organs or materials as well as any type of non-biological materials that are present at a body structure.

10 The device could further include a massaging means to massage the body structures and improve the transparency to the light beams. The device could also include a vibrating means to vibrate the body structures to provide additional or alternative massaging effects. Examples of a vibrating means include an ultrasonic means, a piezoelectric means or a mechanical means. The present invention could also include the application of an agent to  
15 the body structures before, during or after the application of the hygienic treatment. Examples of agents are, for instance, bioprotective agents, photocatalyst, treatment gels or cream, soothing agents, skin permeation enhancers or the like.

The device of the present invention could be a handheld device. In one aspect, the device  
20 could be a brush. In another aspect the device could be a comb. Furthermore, the device of the present invention could include several detachable components such as a detachable handle and a detachable head. The detachable head includes optical paths to generate and

deliver the light beams to the structures. The head could be split up into at least two other detachable components. A first component that could include the light sources to generate the light beams and a second component that could include means to guide and output the light beams to the structures. All these components could be disposable components. A  
5 cradle could be included to store the device, reload the power supply of the device, as well as a means to communicate with a hygienic service provider and/or testing means. The cradle could also host a displaying means and a selecting means.

### BRIEF DESCRIPTION OF THE FIGURES

10 The objectives and advantages of the present invention will be understood by reading the following detailed description in conjunction with the drawings, in which:

**FIGS. 1-2** show examples of applying hygienic effects to body structures in a quasi-stationary manner according to the present invention;

**FIG. 3** shows an example of a fluence effect as a result of a small and a large light  
15 beam;

**FIGS. 4-5** show examples of applying hygienic effects to body structures in a dynamic manner according to the present invention;

**FIG. 6** shows an example of applying multiple hygienic effects to body structures according to the present invention;

20 **FIG. 7** shows an example of the device according to the present invention;

**FIG. 8** shows examples of different configurations of the head of the device according to the present invention;

**FIG. 9** shows another example of the device according to the present invention

**FIGS. 10-12** shows examples of the device with a brush according to the present invention;

**FIGS. 13-14** shows examples of the device with a vibrating means according to the present invention;

**FIG. 15** shows the device in combination with a cradle according to the present invention;

**FIG. 16** shows detachable components of the device according to the present invention; and

**FIG. 17** shows different exemplary shapes of the head of the hygienic device according to the present invention; and

**FIG. 18** shows an example of a variation of the massaging and/or vibrating means according to the present invention.

## 15 DETAILED DESCRIPTION OF THE INVENTION

Although the following detailed description contains many specifics for the purposes of illustration, anyone of ordinary skill in the art will readily appreciate that many variations and alterations to the following exemplary details are within the scope of the invention. Accordingly, the following preferred embodiment of the invention is set forth without any  
20 loss of generality to, and without imposing limitations upon, the claimed invention.

The present invention provides a device and method to apply hygienic effects at body structures. In one aspect, the hygienic effect is established by a light source capable of delivering a light beam with a hygienic effect at the body structures. In another aspect, hygienic effects are established by two or more light sources each capable of delivering a light beam with a unique hygienic effect at the body structures. The application of the hygienic effects could be established either in a quasi-stationary manner or a dynamic manner. The light sources are preferably low power light sources including low power lasers, light emitting diodes or low power semiconductor lasers (See, for instance, the following companies which are listed for purposes of illustration and should not be regarded as limiting to the invention: *Coherent Inc., Santa Clara, CA; Microlasers by PolyScientific Inc., Blackbury, VA; Photonic Products, Bishops Stortford, United Kingdom; Organic LEDs by Covion Organic Semiconductors GmbH, Frankfurt, Germany; Blue light emission from porous silicon by University of Science and Technology of China in Hefei*). In general, for the case of two or more light sources, at least two of the same light sources could be used each delivering a unique hygienic effect or at least two different light sources could be used each delivering a unique hygienic effect. The desired hygienic effects that one would like to obtain guides the choice of light sources and its parameters. By varying parameters such as e.g. fluence, spot size, mode such as continuous or pulsed, repetition rate, pulse duration different hygienic effects could be established.

A body structure is defined as any body structure that was created in a natural way, created in an unhealthy way or created in an unnatural way. Examples of naturally created body



structures include the skin, hair and/or nails. Examples of an unhealthy created body structures are body structures that are caused by disease or infections. Examples of unnaturally created body structures are wounds, burns, or surgically created body structures. Body structures encompass any type of microorganism (including disease-causing microorganisms), cell layers, tissues, organs or materials as well as any type of non-biological materials that are present with a body structure.

In general, hygienic effects relate to the cleanliness of these structures, promotion and preservation of health of the structures or freeing the body structure from disease-causing microorganisms. In particular, the present invention encompasses hygienic effects related to the hygienic effect of visible, near ultraviolet and infrared light on these structures, which are known in the art (for a light spectrum refer to page 13 in a book by *Tuner et al.* (1996) entitled "*Laser therapy in dentistry and medicine*" and published by Prisma Books, Grangesberg, Sweden). Examples of such hygienic effects that could be selected as the two or more hygienic effects include anti-inflammatory effects, preventative effects (e.g. disease, irritation or the like), anti-bacterial effects, sterilizing effects, cleaning effects, cosmetic effects, therapeutic effects, healing effects (bio-stimulative effects), bio-altering effects, pain-releaving effects, photo-rejuvenation effects, photodynamic effects, agent-penetration effects, a skin stimulating effect, a hair growth stimulating effect or a nail treatment effect.

To establish a particular hygienic effect at a body structure one needs to consider the light source properties such as the type of low power light source, wavelength of the light beam, the continuous or impulse mode of operation of the light sources, characteristics of the structures, water content of the structures, pigmentation degree of the structures, vascularization of the structures, vitality of the structures, heterogeneity of the structures, specific heat conductivity of the structures, the fluence of light penetration through a structure or the time exposure needed for the light beam. The art provides teachings on hygienic photo-effects of structures including guidelines regarding parameters such as the type of light source, selection of wavelength(s), fluence, penetration, selection of spot size, recommended pulse duration, recommended repetition rate, or the like. The selection of the hygienic effect(s) as part of the present invention incorporate these teachings as well as new teachings that become available in the art describing newly identified hygienic effects.

Currently available teachings are described in the following books, which provide an exemplary list rather than a comprehensive list. The list includes a book by *Goldman* (1981) entitled "*The biomedical laser: technology and clinical applications*" and published by Springer-Verlag, New York; a book by *Katzir* (1993) entitled "*Lasers and optical fibers in medicine*" and published by Academic Press, New York; a book by *Hajder et al.* (1994) entitled "*Acupuncture and lasers*" and published by Ming, Belgrade; a book by *Tuner et al.* (1996) entitled "*Laser therapy in dentistry and medicine*" and published by Prisma Books, Grangesberg, Sweden; a book by *Alster et al.* (1996) entitled "*Cosmetic laser surgery*" and

published by Wiley & Sons, New York; or a book by *Fitzpatrick et al.* (2000) entitled “*Cosmetic Laser Surgery*” and published by Mosby, St. Louis).

**FIG. 1** shows a first exemplary embodiment of two light sources **110, 120** delivering a light beam with a green wavelength **112** and a light beam with a blue wavelength **122**, respectively. The green wavelength **112** and blue wavelength **122** each provide a unique hygienic effect when applied in a quasi-stationary manner to body structure **130**. In this example, both light beams **112, 122** have a fairly superficial hygienic effect at body structure **130** as shown by **114, 124**. In general, two or more light sources could be used such as  $n$  light source **140-1** to **140-n**. As discussed *supra*, two of the same light sources could be used such as two light sources **150-1, 150-2** that each deliver blue light, however, with at least one different parameter to establish a different and unique hygienic effect for each of the two light sources **150-1, 150-2**. Such as different and unique hygienic effect could be established by different fluences for each of the two light sources **150-1, 150-2**, i.e. **fluence 1** and **fluence 2**, respectively. Another examples is that there is one light source, e.g. **140-1** or **150-2**, to deliver a hygienic effect. Yet another example is that there are three light sources, of which two are the same **160-1, 160-2** and one **160-3** is different, though all three delivering a unique hygienic effect.

Body structure **130** is shown as a structure with a homogenous consistency. However, most structures that one would encounter, as described *supra*, have a heterogeneous consistency or formation. **FIG. 2** shows a second exemplary embodiment of two light sources **210, 220**

delivering in a quasi-stationary manner a light beam with a green wavelength **212** and a light beam with a red wavelength **222**, respectively to a heterogeneous body structure **230**. Structure **230** distinguishes three different layers, i.e. a superficial layer **232**, a middle layer **234** and a deep layer **236**. The green wavelength **212** and red wavelength **222** each provide a unique hygienic effect when applied at body structure **230**. Light beam **212** has a superficial hygienic effect as shown by **214**, which is similar to the example in **FIG. 1**. However, light beam **222** has a hygienic effect in superficial layer **232** that extends to part of middle layer **234**. In other words, the red wavelength penetrates deeper in structure **230** than the green or blue wavelengths.

In addition, as it is known in the art, the relative subsurface fluence of a light beam in a structure **310** is dependent on the spot size, which could be relatively small **320** or relatively large **330**, as shown in **FIG. 3**. The contour lines **322**, **333** represent the relative subsurface fluences for identical fluences for the small **320** and large **330** spot size, respectively. The same subsurface fluence values appear at deeper levels with the larger **330** spot size compared to the smaller spot size **320**.

**FIGS. 1-2** show exemplary embodiments of different hygienic effects in a body structure in which the light beams are applied in a quasi-stationary manner. **FIGS. 4-5** show exemplary embodiments of the application of hygienic effects as shown respectively in **FIGS. 1-2**, but now in a dynamic manner. Movement **410** of light sources **110**, **120** concurrently applies the hygienic effects **114**, **124** to different locations at body structure **130** to achieve

blending of these two unique hygienic effects at these different locations; **420** is an example of a blended hygienic effect of light beams **112, 124** as a result of movement **410**, which is a blend of blue and green light. Movement **510** of light sources **210, 220** concurrently applies the hygienic effects **214, 224** to different locations at body structure **230** to achieve

5 blending of these two unique hygienic effects at these different locations where some of the areas of penetration overlap; **520** is an example of a blended hygienic effect of light beams **212, 224** as a result of movement **510**, which is a blend of red and green light. Note that there are areas where the hygienic effects do not blend together due to different penetration areas, though these hygienic effects are applied in a concurrent fashion. The movement

10 relative to structure **130** is not limited to movement **410, 510** (i.e. **Z** translation), but could be applied in **X, Y**, or **Z** direction (translation/rotation).

**FIG. 6** shows an exemplary embodiment related to the application of a plurality of light beams **610 ... 610n** produced by light sources **620 ... 620n**. On the one hand, light beam

15 **610** could provide one or more hygienic effects focusing on the superficial skin layer **630** (epidermis) and could be selected as an anti-inflammatory effect, preventative effect, an anti-bacterial effect, a sterilizing effect, a cleaning effects, a therapeutic effect, a healing effect, a bio-stimulative effect, a bio-altering effect, a pain-releaving effect, a tissue rejuvenating effect, a photo-rejunivating effect, a photo-dynamic therapy effect and/or an

20 agent penetrating effect. On the other hand, light beam **610n** could provide one or more hygienic effects focusing on the subcutaneous skin layer **640** (e.g. dermis as indicated by arrow or deep fascia (not indicated by arrow), muscle (not indicated by arrow), etc.) and could be selected as, but not limited to, an agent penetrating effect, a preventative effect, a

therapeutic effect, a healing effect, a bio-stimulative effect, a bio-altering effect, a pain-releaving effect, a tissue rejuvenating effect, a photo-rejuvenating effect, and/or a photodynamic therapy effect. Again, as described *supra*, the application to the two skin layers could be accomplished in a quasi-stationary manner, but preferably in a dynamic manner  
5 more or less similar to the movements related to brushing.

A first embodiment of a device of the present invention includes a head **710** and a handle **720** as shown by device **700** in **FIG. 7**. In one aspect, the handle and the head could be a single piece (not shown). However, in another aspect, as shown in **FIG. 7**, head **710** and  
10 handle **720** could be two separate parts of device **700**, which would be preferred since it allows the user to replace the head with a new head or a different style head. The handle could take any shape and is not limited to the shape of handle **720** as shown in **FIG. 7**. However, it would be preferred to have an ergonomically shaped handle that easily fits in a user's hand. Different shapes and sizes of handles would then accommodate the shapes and  
15 sizes of the hands of children and adults. The inside **712** of head **710** includes light sources **730** (i.e. **730A**, **730B**) and deliver light beams **740** with the desired hygienic effect as discussed *supra*. For illustrative purposes it could be assumed that there are two light sources delivering a light beam **742** with a first hygienic effect and a light beam **744** with a second hygienic effect. However, as described *supra* the present invention is not limited to  
20 two light sources and could be one or more than two. Light sources **730** are powered by a power supply **750**, such as a (rechargeable) battery. Power supply **750** is connected to a switch **760**. Switch **760** is preferably positioned at the outside of head **720** and controls the on/off stage of power supply **750** and therewith the on/off stage of light sources **730**. The

present invention is not limited to one switch as there could also be multiple switches to control individual light sources or parameters. The inside **712** of head **720** includes an optical means with optical paths to direct light beams **742, 744** from the inside of head **720** to the outside of head **720**. As a person of average skill in the art to which this invention  
5 pertains would readily appreciate, this could be accomplished in different ways. To accomplish the output of light beams **742, 744** one could establish different optical means or pathways, which could include one or more optical components. Examples of such optical components, which are commonly available in the art, include optical fibers, lenses, spectral filters, mirrors, transparent materials, semi-transparent materials, prisms, reflective  
10 coatings, reflecting grooves, beam splitters, collimators, light channels and gratings.

In the example of **FIG. 7**, the optical means includes reflective prisms **770** to reflect and direct light beams **742, 744** in such a way that they are able to pass through openings **780** as shown in **FIG. 7** (note that for clarity only one opening is indicated by **780**). Optical means  
15 could include a main reflective prism **790** at the end of the optical pathway in head **720** to further assist in outputting light beams **742, 744**. Likewise, the optical means at the inside of head **720** could further include a reflective coating **795** to assist in outputting light beams **742, 744**. Openings **780** could be considered as part of the optical means. Openings **780** could define a spot size. Openings **780** could also include one or more optical components  
20 such as a lens, a transparent material a semi-transparent material, or the like.

**FIG. 8** shows different exemplary heads **810, 820** and **830** each with a different solution to outputting the light beams, which are shown for illustrative purpose only and should not be

regarded as limiting to the invention. In the example of **FIG. 8**, three different hygienic light beams **840, 850, 850** are used. It is noted that the present invention is not limited to three different light beams, since it is also possible that one type of light beam, two different types of light beams or more than three different types of light beams can be used in the examples of **FIG. 8**. A first variation of the optical means could result in head **810** outputting light beams **840, 850, 850** through three rectangular shapes **812, 814, 816** distributed over head **810**. Another variation of the optical means could result in head **820** outputting light beams **840, 850, 850** through three rectangular shapes **822, 824, 826** distributed over head **820**. Yet another variation of the optical means could result in head **830** outputting light beams **840, 850, 850** through fifteen circular shapes **832, 834, 836** distributed over head **830** (note that only three circular shapes as indicated by **832, 834, 836** respectively). A consideration in the design of the optical outputs in a head relates to the ergonomics and ease of using the head when the hygienic effects are applied to a body structure.

A second embodiment of a device of the present invention is similar to device **700** as shown in **FIG. 7** and is shown as device **900** in **FIG. 9**. Device **900** includes a head **910**, handle **920**, light sources **930** (i.e. **930A, 930B, 930C**), power supply **940** and switch **950**. The difference, however, between device **700** and device **900** is in the optical means. Device **900** includes optical fibers **932, 934, 936** that output the light beams from the light sources **930** through openings **960**. In the example of device **900** there could be three light sources each delivering a light beam with a unique hygienic effect that is guided through optical fibers **932, 934, 936** respectively. There could be one optical fiber **960** connected to



one opening or there could be several optical fibers bundled **970** together to output through one opening.

It has been shown that effect of radiation is improved in combination with massaging the  
5 gums. Pressuring alive soft tissue causes an increase in its transparency thereby providing for better penetration of the radiation (See *GA Askaryan (1982)* in a paper entitled "*The increasing of transmission of laser and other radiation through the sift turbid physical and biological media*" and published in "*Kvantovaya Electronika, V9(N7):1370-1383*). The present invention generalizes this concept. Accordingly, the present invention could  
10 include a massaging means to massage the body structure(s) and improve the transparency to the light beams. A first aspect of applying a massaging effect relates to the movement of the head or the pressure of the head against the body structures will apply a massaging effect.

15 **FIG. 10** shows a second aspect of applying a massaging effect. Device **1000** is similar to device **700** with the difference of a massaging means **1010**. Massaging means **1010** could be a brush or a comb. The bristles of the brush could be positioned in any direction with respect to the handle. For instance, bristles could be positioned more or less perpendicular to the head as shown by bristles **1010** or bristles could be positioned under an angle with  
20 respect to the head as shown by bristles **1020** and bristles **1030**. The direction of the bristles could depend on the type or shape of the head or the type of massaging effect that would be desired. The type and size of bristles is dependent on the type of body structure. It would however be preferred to have flexible bristles that do not irritate or damage the

structures. For instance, bristles could be made out of nylon, soft fiber, or any synthetic blend. The bristles could be attached to head **710** in a similar fashion as to how bristles are attached to a brush head or comb head. Massaging means is used in a similar fashion as a brush to add a massaging effect to the hygienic effect of the light sources. Device of the present invention could be a brush or a comb that provides hygienic effects according to the teachings of the present invention.

**FIG. 11** shows a similar device **1100** as device **900** shown in **FIG. 9** with the difference of the massaging means **1010**. **FIG. 12** shows device **1200**, which is a variation of device **1100** as shown in **FIG. 11**. Device **1200** includes multiple optical fibers **1210** (2 fibers), **1212** (2 fibers), **1214** (2 fibers), **1216** (2 fibers) that transmit light beams from light source **1220** (including four light sources **1220A**, **1220B**, **1220C**, **1220D**). Another variation shown in **FIG. 12** with respect to device **1100** is that the light beam does not pass through the openings **960** as shown in **FIG. 9**. Instead, an optical connection between the optical fibers and the bristles is created to establish that the bristles are able to continue to guide the light beams and finally output the light beams. In this case the bristles should be made out of materials capable of guiding light and flexible enough to prevent irritation or damage to the structures.

In another aspect, the present invention could include a vibrating means to vibrate the body structures and therewith provide an additional massaging effect. Examples of vibrating means that could be used are an ultrasonic means, a piezoelectric means or a mechanical means. Such vibrating means are known in the art. **FIG. 13** shows a head **1300** with a

vibrating means **1310**. Since vibrating means **1310** is positioned against the inner edge **1320** of head **1300**, the entire head **1300** might vibrate. **FIG. 14** shows a head **1400** with a vibrating means **1410** that is connected in such a way to vibrate massaging means **1010**, i.e. vibrating the bristles to provide an additional massaging effect to the massaging effect established by the bristles through movement as described *supra*.

**FIG. 15** shows a cradle **1510** that can be used to store the hygienic device **1512** or the head **1514** of the hygienic device **1512**. Cradle **1510** could also be used as a power supply (re)-charging device. In one aspect, hygienic device **1512** is placed in cradle **1510** and the power supply in the head is connected to a power recharging mechanism via the handle. In another aspect it would be possible to position the power supply of the hygienic device inside the handle, which is then directly connected to a power recharging mechanism. In yet another aspect, the head **1514** of the hygienic device is placed in cradle **1510** and the power supply in the head is directly connected to a power recharging mechanism.

Cradle **1510** could include a selection means **1540** for a user to select the hygienic effects or treatment parameters related to the unique hygienic effects. Selection means **1530** could be a selection means with, for instance, four arrow buttons **1532** and one center button **1534**. Each arrow button **5132** corresponds to a function or selection that could be selected from a displaying means **1520**. The up, down, left and right arrow buttons could relate to the browsing or selection from displaying means **1520**. Displaying means **1520** could be any type or size of displaying means that would fit the cradle and is useful to the user. Necessary software and hardware components would be included to provide the

functionality to display the parameters, selections and/or functions as well as provide functionality to the buttons. Center button **1534** could be used as the enter button to confirm a selection as is common in the art. The cradle could include different variations of a selection means and is not limited to the selection means shown by **1530**.

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Cradle **1510** could also include a slot **1540** for a read/writer card **1550** to read or write data. Examples of read/writer card **1550** are for instance a memory stick, compact flash card, smart media card, secure digital card, multi media card, microdrive or the like, which are common in the art. Read/writer card **1550** can upload information to the device, store  
10 information from the device, and could be interactively used with any type of hygienic service provider. A communication means such as a wireless protocol or Internet protocol could be included with the device to communicate with a hygienic service provider.

The present invention has now been described in accordance with several exemplary  
15 embodiments, which are intended to be illustrative in all aspects, rather than restrictive. Thus, the present invention is capable of many variations in detailed implementation, which may be derived from the description contained herein by a person of ordinary skill in the art. For instance, the hygienic device of the present invention could be a handheld device. Furthermore, the hygienic device could have several removable or detachable components,  
20 which would allow these components to be changed, renewed or updated. For example, the components could be disposable components, or even recyclable components. **FIG. 16** shows some examples **1600A**, **1600B** of configurations of detachable components of the hygienic device, which are shown for illustrative purposes only and should not be regarded

as limiting to the invention. Device **1600A** shows a head **1610** for optical guidance and output of the light beams, a mid-component **1620** hosting the light sources **1622** and the power supply **1624**, and a handle **1630** with a switch **1632**. Device **1600B** shows a head **1640** for optical guidance and output of the light beams, a mid-component **1650** hosting the light sources **1652**, and a handle **1660** with a switch **1662** and a power supply **1664**. Another variation is that the device of the present invention could have pre-arranged settings or memory similar to car seat adjustment for individual users. This would allow different users to retrieve their personal settings by a simple click of a button or a simple voice command to the device.

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Yet another variation to the hygienic device is the shape of the device; in particular the shape of the head component or the head and mid-components combined. **FIG. 17** shows two examples of shapes that could be used, which are shown for illustrative purposes only and should not be regarded as limiting to the invention. Shape **1710** has an irregular but smooth surface that would for instance be desired to enhance the massaging effect or contribute to the output path of the light beams. Shape **1720** has a banana-like or curved shape and would for instance be desired to approach particular body structures that are difficult to access with a more rectangular shaped-component or device.

20 **FIG. 18** shows still another variation of a device **1800** to apply different hygienic effects. Device **1800** has multiple arms **1810** on which light sources **1820**, **1830** and **1830** are attached. Light sources **1820**, **1830** and **1830** could for instance be a blue, green and red light sources each providing a different and unique hygienic effect. Again as discussed

*supra* the type of light source and number of light sources can be varied and is dependent on the objectives of hygienic application(s). Light sources **1820**, **1830** and **1830** could be placed at various different locations on arms **1810** and is not limited to the arrangement as shown in **FIG. 18**. The light **1850** that is outputted by each light source can also be  
5 delivered in different directions and is not limited to the directions shown in **FIG. 18**. Device **1800** could also include a massaging means and/or vibrating means **1860**, which could provide additional vibration by similar massaging and/or vibration means as discussed *supra*. Massaging means and/or vibrating means **1860** could operate all arms **1810** simultaneously or one or more individual arms **1810** independently. Device **1800**  
10 include a hand piece **1870** that includes the light sources **1872** and one or more switches **1874**. Optionally hand piece **1870** could include a display **1876** or a memory slot or communication means **1878**.

Still another variation is to include pressure sensors with the device to control the pressure  
15 that is being applied to the body structures. The pressure sensors could provide feedback to the user about the amount of pressure or could provide feedback to a control system that controls the amount of pressure that is being applied.

Still another variation is that an agent could be used and applied to the body structures  
20 before, during or after the application of the hygienic treatment. Examples of agents are for instance bioprotective agents, photocatalyst, treatment gels or cream, soothing agents, skin permeation enhancers or the like (See, for instance, the following companies/products which are listed for purposes of illustration and should not be regarded as limiting to the

invention: *Neova* by *Procyte Corp.* [www.procyte.com](http://www.procyte.com); *Medicalia Inc.* [www.medicalia.com](http://www.medicalia.com); or *ESBA Laboratories Inc.*). Such agents could work as a catalyst, soother or enhancer to the structures. Still another variation relates to verifying the condition of the body structures before, during or after a hygienic treatment is applied. Such a diagnostics for structures could, for instance, be employed by means of spectroscopy resolved fluorescence (See e.g. *Pferer et al.* (2003) in a paper entitled “*Temporally and spectrally resolved fluorescence; spectroscopy for the detection of high grade dysplasia in Barrett’s esophagus*” and published in “*Lasers in Surgery and Medicine* 32:10-16). Diagnostics of the structures could provide valuable information to evaluate and compare the efficacy of the hygienic treatment. All such variations are considered to be within the scope and spirit of the present invention as defined by the following claims and their legal equivalents.

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